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/13046

AGROTECHNOLOGY

SYNTHETIC PLANT-GROWTH REGULATORS

Moscow PRAVDA in Russian 27 Nov 86 p 4

[Article by O. Frantsen]

[Abstract] Synthetic plant-growth regulators are being developed and tested by many research teams in the USSR, particularly the All-Union Scientific Research Institute of Applied Molecular Biology and Genetics and the Institute of Plant Physiology, USSR Academy of Sciences. V. Shevelukha heads the coordination council for the conduct of such studies, and is also scientific leader of the laboratory of growth regulators and development of agricultural plants, Timiryazev Agricultural Academy. In addition to making plants taller, special growth regulators called retardants can also make plants shorter. For example, the stems of new miracle wheat are shorter and stronger so that the wheat is not knocked down by high winds and strong rain storms. Thus, large quantities of wheat previously lost to this sort of mechanical damage can now be harvested, since the wheat, like a green spring, rebounds to its upright position after the storm passes by. A variety of plant-growth regulators, acting on the hormone balance in plants, can give a variety of desirable characteristics to plants used in agriculture.

6508/13046
CSO: 1840/209

BIOCHEMISTRY

UDC 543.542.2

SYNTHESIS AND PROPERTIES OF AFFINITY ADOORBENT FOR PURIFICATION OF VARIOUS NEURAMINIDASES

Moscow PRIKLADNAYA BIOKHIMIYA I MIKROBIOLOGIYA in Russian Vol 21, No 3, May-Jun 85 (manuscript received 27 Dec 83) pp 365-371

[Article by A.N. Poltorak, S.V. Martyushin and V.A. Pasechnik, All-Union Scientific Research Institute of Especially Pure Biological Preparations, Leningrad]

[Abstract] Difficulties are encountered in the use of weak inhibitors such as para-aminophenoxyamic (PAPOA) acid as ligands in affinity chromatography. When PAPOA is used as a ligand, the properties of the adsorbent must be analyzed to determine the specific nature of the interaction between enzyme and ligand. This work presents such an analysis, as well as an attempt to develop conditions of the neuraminidase purification process. Results of a previous work had shown that PAPOA is a relatively weak neuraminidase inhibitor. To clarify the role of the inhibitor in bonding of the enzyme to the adsorbent, neuraminidase was eluted in a linear PAPOA gradient. Creation of a linear pH gradient allowed a significant increase in the purification of neuraminidase. Adsorption at pH 5.5 was utilized for neuraminidase from *El. perfringens*, noncholera vibrio and influenza virus. It was found that some 90% of the neuraminidase bonded with the adsorbent was eluted at pH 6.5. The pH gradient method allowed production of electrophoretically homogeneous neuraminidase from the noncholera vibrio and influenza virus. Figures 7; references 14: 2 Russian, 12 Western.

6508/13046
CSO: 1840/191

ISOLATION AND STUDY OF SOME PROPERTIES OF HEMAGGLUTININS PRODUCED BY
ACTINOMYCETES STREPTOMYCES BADIUS

Moscow PRIKLADNAYA BIOKHIMIYA I MIKROBIOLOGIYA in Russian Vol 21, No 3,
May-Jun 85 (manuscript received 9 Jan 84) pp 372-377

[Article by O.A. Belyayev, G.Ye. Grinberg, Yu.Ye. Konev, L.L. Dubovenko and
G.A. Mikhalets, All-Union Scientific Research Technologic Institute of
Antibiotics and Enzymes for Medical Use, Leningrad]

[Abstract] Least-studied of the hemagglutinins are those of fungi and particularly actinomycetes. These hemagglutinins can be used as specific phytohemagglutinins in the study of the antigen determinant of erythrocytes. A nonspecific hemagglutinin, causing hemagglutination of erythrocytes of all human blood groups and birds, has been recommended for use for the treatment of wounds, radiation sickness and malignant neoplasms. The insufficient level of study of hemagglutinins is related to difficulties in isolation, purification and identification. The purpose of this work was to select an effective hemagglutinin-producing strain, isolate and describe the substance responsible for polyagglutinability, and evaluate the ability of actinomycetes to change the group membership of erythrocytes. No strains were found among the 150 tested which changed the group membership of erythrocytes in a particular direction, though a number of strains caused hemolysis. Some 17% of the strains developed hemagglutinins giving the erythrocytes polyagglutinability properties. The most manifest and stable polyagglutination properties were those of the species *streptomyces badius*. The hemagglutinin was found to be a protein with a molecular weight of about 75,000, containing no carbohydrates. Instability of lyophilized preparations upon storage indicates the enzymatic nature of the hemagglutinin, which must be further confirmed. The hemagglutinin is adsorbed on erythrocytes in small quantities. This and the unsuccessful attempts to desorb the hemagglutinin indicate a possible enzyme mechanism of hemagglutination. Figures 2; references 19: 9 Russian, 10 Western.

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CSO: 1840/191

CONDITIONS OF FORMATION OF PORPHYRINS BY PROPIONIC ACID BACTERIA

Moscow PRIKLADNAYA BIOKHIMIYA I MIKROBIOLOGIYA in Russian Vol 21, No 2, Mar-Apr 85 (manuscript received 11 Jun 84) pp 154-160

[Article by O.V. Polulyakh, N.I. Zaitseva and V.Ya. Bykhovskiy, Institute of Biochemistry imeni A.N. Bakh, USSR Academy of Sciences, Moscow]

[Abstract] The study of the microbiological synthesis of porphyrins is of practical interest, since porphyrins and their metal complexes can be used in the medical, chemistry and food industries. Porphyrins can be synthesized by the biosynthetic activity of living systems, enzyme blood elements, plant cells, tissues and microorganisms. This article presents results of studies of the formation of porphyrins by propionic acid bacteria as a function of the type of microorganism and fermentation conditions. Seven propionic acid bacteria cultures were used with six species of propionibacterium. All cultures synthesized both groups of tetrapyrrole compounds. Studies of the chemical nature and isomer composition of the porphyrins showed that they consist mainly of coproporphyrin III with small amounts of uroporphyrin III and other carboxylic tetrapyrroles. The major carbohydrate component of the medium supporting biosynthesis was glucose. The greatest quantity of both porphyrins and vitamin B₁₂ was synthesized with 2.0% glucose by weight in the nutrient medium. The experiments indicate that propionic acid bacteria, in addition to species and strain specificity, are greatly influenced by such components of the medium as glucose, salts of cobalt and exogenous δ-aminolevulinic acid. Although increasing the content of δ-ALA increases the quantity of porphyrins formed, its utilization is greatly decreased, reducing the efficiency of the process. References 27: 17 Russian, 10 Western.

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CSO: 1840/190

BIOSPECIFIC ADSORPTION CHROMATOGRAPHY OF PHOSPHOLIPASE A₂ FROM VARIOUS SOURCES

Moscow PRIKLADNAYA BIOKHIMIYA I MIKROBIOLOGIYA in Russian Vol 21, No 2, Mar-Apr 85 (manuscript received 9 Mar 83) pp 190-198

[Article by M.M. Rakhimov, R. Akhmedzhanov, I.T. Yakubov and B.A. Tashmukhamedov, Tashkent State University]

[Abstract] The major purpose of this work was development of effective methods of separation of various forms of phospholipase A₂ from various sources using biospecific chromatography on an adsorbent synthesized by covalent attachment of phospholipase-phosphatidyl ethanolamine substrate to

a polyamide carrier by means of a bifunctional compound--glutaric aldehyde. The insoluble carrier used was powdered polyamide (capron), which has a number of advantages over the widely used polysaccharide carriers: mechanical and chemical strength, porosity, availability, easy chemical activation, and imperviousness to microorganisms and enzymes. It was found that by using the adsorbent synthesized and selecting adsorption and desorption conditions for phospholipase A₂, it was possible to purify and separate various forms of the enzyme. For pancreatic phospholipase A₂, the enzyme produced was rather homogeneous, eluted in a single peak in gel chromatography on G-50 sephadex and yielded a single peak in disk electrophoresis in 15% polyacryamide gel. Phospholipase from other sources was not electrophoretically homogeneous, containing minor secondary components. Figures 2; references 22: 12 Russian, 10 Western.

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CSO: 1840/190

UDC 577.37;576.314

STUDY OF ADSORPTION OF SPIN-LABELED FLOCCULANTS ON E. COLI CELLS

Moscow PRIKLADNAYA BIOKHIMIYA I MIKROBIOLOGIYA in Russian Vol 21, No 5, Sep-Oct 85 (manuscript received 17 Jul 83) pp 691-697

[Article by N.I. Kuptsova, N.V. Nikitin, B.P. Nikolayev, L.N. Petrov, A.Ya. Teslenko and D.K. Toropov, All-Union Scientific Research Institute of Especially Pure Biological Preparations, Leningrad]

[Abstract] The search for effective flocculants requires study of problems of the behavior of chain macromolecules near the surface of intact cells of microorganisms. In this article, the method of spin-labeling is used to study the interaction of intact E. coli cells with polyethylene imine, a flocculating polymer and dextran. The EPR spectra indicate that the radical fragments in the polymers retain free movement. The spin-labeled compounds in the cell suspensions and solution do not at first differ from each other, but then a gradual decrease in intensity of all three spectral components occurs simultaneously in the solution, and in less than 30 minutes the intensity of the EPR spectral lines of the low-molecular-weight spin probe drops to 0. No changes in spectral form or component ratios occur during this time. The methodological approach used in this article for investigation of flocculation of E. coli cells by water-soluble polymers is not limited to processes of precipitation and concentration; it could also be extended to a broad range of microorganisms and phenomena accompanying such technological procedures as immobilization of cells in a gel and encapsulation. Figures 3; references 13: 8 Russian, 5 Western.

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COUPLING OF PROPIONALDEHYDE TO LARGE-PORE GLASS SURFACE

Moscow PRIKLADNAYA BIOKHIMIYA I MIKROBIOLOGIYA in Russian Vol 21, No 4, Jul-Aug 85 (manuscript received 10 Aug 83) pp 533-536

[Article by Ye.A. Glazunov and V.M. Chernayenko, Leningrad Institute of Nuclear Physics, USSR Academy of Sciences]

[Abstract] A simple method is devised for coupling aliphatic aldehydes to large-pore glass for eventual use in protein immobilization. The basic steps consist of treatment of the glass (200 nm pore diameter, 0.68 cm³/g porosity, 14 m²/g sp. surface area, 100 μmoles/g hydroxyl groups) with concentrated HCl containing 3 v% H₂O₂ for 1 h, followed by washing with distilled water and acetone to neutral pH and drying in vacuo at 150°C for 5 h. The dried glass was then exposed to 4% (3,3-diethoxypropyl)-triethoxysilane in toluene and boiled for 24 h. The treated glass was then collected on a glass filter, washed in succession with toluene and acetone and dried at 105°C for 18 h. Conversion to propionaldehyde was attained by treatment with 1 N HCl for 1 h and washing with distilled water to neutral pH. Immobilization studies with *E. coli* polynucleotide phosphorylase, BSA, and chick intestinal alkaline phosphatase demonstrated the efficiency of the propionaldehyde groups in firmly binding the enzymes with retention of activity. Conversion of the aldehyde groups to alcohol groups by treatment with 1 N HCl and reduction with 0.1% NaBH₄ resulted in a significant decrease in nonspecific adsorption of proteins. Figures 1; references 6: 5 Russian, 1 Western.

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CSO: 1840/192

BIOACTIVE SUBSTANCES OF BOTRYTIS CINEREA (LITERATURE REVIEW)

Moscow PRIKLADNAYA BIOKHIMIYA I MIKROBIOLOGIYA in Russian Vol 21, No 6, Nov-Dec 85 (manuscript received 4 Apr 84) pp 707-713

[Article by M.V. Filimonova, Main Botanical Garden, USSR Academy of Sciences, Moscow]

[Abstract] A literature review is presented of Soviet and Western publications dealing with the various bioactive substances produced by the fungus *Botrytis cinerea* Pers. Among the substances produced by *B. cinerea* are photoreceptors, phytohormonelike agents, biotin, phytoalexins, antibiotics, phytotoxins, plant growth inhibitors, inhibitors of seed germination, as well as a variety of enzymes, including those with pectolytic and cellulolytic activities. One of pathogenic mechanisms of *B. cinerea* is its capability to metabolize phytoalexins produced by plant hosts. Figures 3; references 41: 28 Russian, 13 Western.

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IMMOBILIZATION OF GLUCOSE OXIDASE IN POLYACRYLAMIDE COATING FORMED BY ELECTROCHEMICAL INITIATION OF POLYMERIZATION

Moscow PRIKLADNAYA BIOKHIMIYA I MIKROBIOLOGIYA in Russian Vol 21, No 6, Nov-Dec 85 (manuscript received 26 Sep 83) pp 799-804

[Article by L.S. Tikhonova, O.A. Belozerova, Ya.D. Zytner, A.N. Galushkin, Yu.B. Kuts, A.G. Yefimov and K.A. Makarov, First Leningrad Medical Institute]

[Abstract] A method has been devised for the preparation of electrodes coated with polyacrylamide (PAA) incorporating glucose oxidase with retention of high enzymatic activity. An effective coating method consisted of electrochemical polymerization of a solution containing 5.35 M acrylamide, 0.065 M N,N'-methylenebisacrylamide, 0.1 M ZnCl₂, 8.52 mg% glucose oxidase, pH 4.0 on a nickel electrode. Electrolysis for 20 min with a -1.3 V cathode potential yielded an electrode with an activity of 0.37 arbitrary units, twice as high as previously obtained by adsorption of the enzyme to PAA-coated electrode. Even better results were obtained by electrochemical polymerization of a solution of 4.5 M acrylamide, 0.09 M N,N'-methylenebisacrylamide and 0.1 M ZnCl₂, followed by exposure to a 25% solution of glutaraldehyde, washing with water for 5 h, and incubation with a 1200 mg% glucose oxidase solution in phosphate buffer, pH 6.9. The latter method yielded an electrode with an arbitrary activity of 0.7 units initially, with retention of 0.235 units of activity after 60 days of storage in air at 25°C. Figures 4; references 4 (Russian).

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AMPEROMETRIC SENSOR FOR ENZYME IMMUNOASSAY

Moscow PRIKLADNAYA BIOKHIMIYA I MIKROBIOLOGIYA in Russian Vol 21, No 6, Nov-Dec 85 (manuscript received 18 Nov 83) pp 821-825

[Article by D.M. Ivnitskiy, B.B. Dzantiyev, A.M. Yegorov and A.P. Kashkin, Institute of Biochemistry imeni A.N. Bakh, USSR Academy of Sciences, Moscow; Samarkand Medical Institute; Moscow State University]

[Abstract] An amperometric sensor has been developed for use in the immuno-peroxidase technique, which allows detection of horseradish peroxidase with a sensitivity of 5×10^{-11} M through the oxidation of iodide ions by generated hydrogen peroxide. The sensor may be used directly in conventional polystyrene wells, and consists of a combined electrode pair of carbon and Ag/AgCl electrodes with potentiometric recording of the current resulting from reduction of the substrate. Results obtained with the amperometric sensor had a precision of 10-12% in determination of potato X virus, and showed good overlap with spectrophotometric analysis of enzyme activity. Figures 5; references 10: 5 Russian, 5 Western.

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CSO: 1840/194

UDC 581.19:547.944/945

IMMOBILIZATION OF ANABASINE-OXIDIZING MICROORGANISM PSEUDOMONAS INDIGOFERA

Moscow PRIKLADNAYA BIOKHIMIYA I MIKROBIOLOGIYA in Russian Vol 22, No 1, Jan-Feb 86 (manuscript received 20 Dec 83) pp 49-52

[Article by N.A. Aytkhozhina, S.K. Dolobayeva and L.K. Klyshev, Institute of Molecular Biology and Biochemistry, KSSR Academy of Sciences, Alma-Ata]

[Abstract] Anabasine and some of its derivatives are used in medicine and in agriculture; therefore, it was felt to be of great interest to find ways of mass-producing them. In this study an attempt was made to develop methods for immobilization of *Ps. indigofera* cells on polyacrylamide gel to determine their viability and to compare their anabasine-oxidizing ability to that of the free cells. It was shown that immobilization and storage of granules in a phosphate buffer at pH 6.8 did not affect their viability. Chromatographic analysis of the intermediate anabasine-oxidation products showed that both the immobilized and free cells gave identical yields. Figures 1; references 10: 9 Russian, 1 Western.

7813/13046
CSO: 1840/195

UDC 595.766.1+577.150.7

BIOLUMINESCENT ASSAY OF ATP IN FLOW COLUMN REACTOR WITH IMMOBILIZED FIREFLY LUCIFERASE

Moscow PRIKLADNAYA BIOKHIMIYA I MIKROBIOLOGIYA in Russian Vol 22, No 1, Jan-Feb 86 (manuscript received 31 Jan 84) pp 137-143

[Article by Ye.I. Belyayeva, L.Yu. Brovko and N.N. Ugarova, Moscow State University]

[Abstract] An active firefly preparation luciferase was obtained immobilized on BrCN-activated sepharose 4B and an analytical method was developed to assay microquantities ($2 \cdot 10^{-14}$ to 10^{-9} mole/sample) of ATP based on flow column reactor. In this fashion, up to 400 ATP assays could be performed without appreciable loss of the activity of luciferase. The assay can be automated. A storage method for the column with immobilized enzyme was developed based on washing the column with a solution of 0.02 M tris-acetate buffer containing 2 mM EDTA, 2 mg/ml DTT, 0.1 M $MgSO_4$ and 1 mg/ml bovine serum albumin and storing the entire column in the same solution. Figures 4; references 12: 8 Russian, 4 Western (1 by Russian authors).

7813/13046
CSO: 1840/195

SERIAL N-TERMINAL ANALYSIS OF PEPTIDES AT PICOMOLE LEVEL WITH FLUORIMETRIC
DETECTION OF Dns-AMINO ACIDS

Moscow BIOORGANICHESKAYA KHIMIYA in Russian Vol 12, No 2, Feb 86 (manuscript
received 15 Jun 85; revised manuscript received 3 Sep 85) pp 165-171

[Article by N.B. Levina, Kh.G. Muradov and I.V. Nazimov, Institute of
Bioorganic Chemistry imeni M.M. Shemyakin, USSR Academy of Sciences, Moscow]

[Abstract] Development of a method of high-speed quantitative N-terminal analysis of peptides containing up to 30 amino acid residues is described and discussed. The method involves the use of reversed-phase high-efficiency liquid chromatography and a fluorimetric detector. Use of the method of dansylation of peptides, hydrolysis of Dns-peptides and separation of Dns-amino acid made it possible to perform rapid quantitative determination of N-terminal amino acids during analysis of 20-100 picomoles of initial peptide, reduced the total time of analysis by up to 2 hours in comparison with the time required for the classical method (up to 3 hours in case of fragments of membrane proteins) with concurrent increase of yield of Dns-derivatives of N-terminal amino acids up to 80-85 percent, on the average. Figures 4; references: 16 (Western).

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AUTOMATED SYNTHESIS OF OLIGODESOXYRIBONUCLEOTIDES
PART 3. STUDY OF SUPPORTS BASED ON SILICA GELS 'SILOKHROM' AND 'SILIPOR'

Moscow BIOORGANICHESKAYA KHIMIYA in Russian Vol 12, No 2, Feb 86 (manuscript
received 22 May 85; revised manuscript received 15 Jul 85) pp 213-219

[Article by A.I. Lomakin, S.I. Yastrebov and S.G. Popov, All-Union Scientific
Research Institute of Molecular Biology, Koltzovo, Novosibirsk Oblast]

[Abstract] Prospects of increasing the first nucleoside level in oligodesoxyribonucleotides synthesis with the use of silica gels Silokhrom S-80, Silipor-200, Silipor-400 and Silipor-600 are described and discussed. Properties of supports obtained were studied. Supports with high level of the first nucleoside (130-280 μ moles/g) were obtained for automatic synthesis of oligodesoxyribonucleotides on the basis of these silica gels. Methods of increasing the length of the spacer group with the aid of different reagents (n-protected 3-aminopropionic acid and 6-aminocaproic acids) were studied with silica gel Silokhrom S-80 as an example. 6-N-Dimethoxytritylaminocaproic acid proved to be an effective reagent for rapid extension of the spacer group; it maintained the high level of the first nucleoside and improved the properties of the supports. Figures 1; references 12: 6 Russian, 6 Western.

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STUDY OF COMPLEMENTARY ADDRESSED ALKYLATION OF OLIGODESOXYRIBONUCLEOTIDES
2',3'-O-{4-[N-(2-CHLOROETHYL)-N-METHYLAMINO]}BENZYLIDENE DERIVATIVES HAVING
SHORT OLIGONUCLEOTIDE ADDRESSMoscow BIOORGANICHESKAYA KHIMIYA in Russian Vol 12, No 2, Feb 86 (manuscript
received 5 Jul 85), pp 230-239[Article by D.G. Knorre, I.V. Kutyavin, A.S. Levina, N.P. Pichko, L.M. Podust
and O.S. Fedorova, Novosibirsk Institute of Bioorganic Chemistry, Siberian
Department, USSR Academy of Sciences]

[Abstract] Quantitative characteristics of alkylation by reagents with a short address were determined on model oligodesoxyribonucleotide-targets with use of dodecyldeoxyribonucleotide d(pC-C-C-T-G-T-T-G-G-C) (I). Derivatives d(pA-A-C)-A>CHRC1 (II) and d(pA-A-c)-U>CHRC1 (III) [RC1 is 4-[N-2-chloroethyl]-N-methylamino]phenyl] served as reagents. Rate constants at 20°C were $6 \cdot 10^{-6} \text{ s}^{-1}$ and coincide with the ionization rate constant of the C-C1 bond in similar compounds. Constants of association of reagents (II) and (III) with (I), determined from the dependence of the maximum reaction yield, were 300 M^{-1} and 160 M^{-1} , respectively. The maximum yield of the reaction of (I) with (II) under comparable conditions was one order of magnitude higher than that of alkylation with reagent (II) of oligonucleotide d(pT-G-A-G-T-C-G-T-A-T-T-A), which has no region complementary to the address and of alkylation of (I) with the nonaddressed reagent d(pT-T-T)>UCHRC1 (IV). Alkylation of oligonucleotide (I) by reagent (II) proceeded predominantly at C-2 (26 percent), at G-10 (54 percent) and, to some extent, at G-6 (6 percent) and G-11 (14 percent). The ratio of degrees of alkylation of guanines G-6:G-10:G-11 during alkylation of (I) with nonaddressed reagent (IV) was 1:16:1. This demonstrated rather high alkylation selectivity even for reagents with low affinity for the target. It was assumed that modification of (I) at G-10 is associated with the existence of a significant part of the oligonucleotide in hairpin form due to formation of two G-C pairs. Figures 6; references 32: 27 Russian, 5 Western.

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COMPLEMENTARY ADDRESSED MODIFICATION AND SPLITTING OF SINGLE-STRANDED DNA FRAGMENT WITH AID OF ALKYLATING DERIVATIVES OF OLIGONUCLEOTIDES

Moscow BIOORGANICHESKAYA KHIMIYA in Russian Vol 12, No 2, Feb 86 (manuscript received 5 Jul 85) pp 240-247

[Article by Ye.B. Brosalina, V.V. Vlasov, I.V. Kutyavin, S.V. Mamayev, A.G. Pletnev and M.A. Podyminogin, Novosibirsk Institute of Bioorganic Chemistry, Siberian Department, USSR Academy of Sciences]

[Abstract] A study of complementary addressed modification by oligonucleotide derivatives carrying alkylating groups $\text{CH}-\text{C}_6\text{H}_4-\text{N}(\text{CH}_3)\text{CH}_2\text{CH}_2\text{Cl}$ or $\text{ClCH}_2\text{CH}_2(\text{CH}_3)\text{N}-\text{C}_6\text{H}_4-\text{CH}_2\text{NH}-$ of a single-chain 303-nucleotide long DNA fragment, similar in its primary structure to the RNA segment of tick-borne encephalitis virus, is described and discussed. Under conditions of formation of a complex with the DNA fragment, both kinds of derivatives specifically alkylated nucleotides of the DNA fragment in the immediate vicinity of sequences complementary to the oligonucleotides. Alkylation was highly effective and the DNA fragment can be split off specifically at positions of the alkylated nucleotides with a high yield. Figures 7; references 21: 14 Russian, 7 Western.

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ASSOCIATION OF O-SPECIFIC POLYSACCHARIDE FROM PSEUDOMONAS FLUORESCENS AND ANTIBODIES

Moscow BIOORGANICHESKAYA KHIMIYA in Russian Vol 12, No 2, Feb 86 (manuscript received 13 Jun 85) pp 265-271

[Article by T.F. Solovyeva, G.A. Naberezhnykh, A.K. Mazur, V.A. Khomenko and Yu.S. Ovodov, Pacific Ocean Institute of Bioorganic Chemistry, Far Eastern Scientific Center, USSR Academy of Sciences, Vladivostok]

[Abstract] Determination of the number of antigenic determinants of O-specific polysaccharide from *Pseudomonas fluorescens* and the association constant of specific antibodies and polysaccharide is described and discussed. Lipopolysaccharide-protein complexes from *P. fluorescens* were obtained by processing microbial cells by a trichloroacetic solution. Mild acid hydrolysis of the lipopolysaccharide-protein complex and gel-chromatography of the carbohydrate fraction on Sephadex G-50 provided an O-specific polysaccharide. C-nuclear magnetic resonance spectroscopy showed the polysaccharide to be constructed of regularly-repeating trisaccharide links containing three 6-desoxyhexose residues, two of which were amino sugars. The polysaccharide interaction with specific antibodies and monovalent Fab-fragments of the antibodies isolated on a polysaccharide substituted immuno-adsorbent gel is

discussed. Restricted affinity heterogeneity of the antibodies and the cooperative nature of their interaction with the polysaccharide were demonstrated. Data concerning binding of the polysaccharide with Fab-fragments of the antibodies revealed association constants of these complexes and the number of binding sites (7) of the Fab-fragments per polysaccharide molecule. Four repeating units share one binding site. Figures 4; references 20: 1 Russian, 19 Western.

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UDC 575.224.4:577.213.3

MUTAGENESIS DIRECTED BY PHOSPHOTRIESTER ANALOGS OF OLIGONUCLEOTIDES

Moscow BIOORGANICHESKAYA KHIMIYA in Russian Vol 12, No 2, Feb 86 (manuscript received 31 May 85 revised manuscript received 12 Sep 85) pp 289-292

[Article by V.A. Petrenko, P.I. Pozdnyakov, S.M. Kipriyanov, A.N. Boldyrev, L.N. Semenova and G.F. Sivolobova, All-Union Scientific Research Institute of Molecular Biology, Koltsovo, Novosibirsk Oblast]

[Abstract] A study showing that triester analogs of oligonucleotides may be more effective than oligonucleotides of natural structure as mutagenic primers in directed mutagenesis is described and discussed. 20-Mer oligodesoxyribonucleotides were synthesized by a modified triester method. Ethylated dinucleotide blocks were prepared from chlorophenyl derivatives by a transesterification method. Structure of the oligonucleotides was confirmed by the Maxam-Gilbert method. Mutagenesis induced by the oligonucleotides was studied on DNA of M13mpB phage. Ethylation of phosphate groups of oligonucleotides increased the yield of induced mutants significantly. This effect was intensified after replacement of DNA-polymerase A by full-value DNA-polymerase I of *E. coli*. Presence of the triester segment protected the oligonucleotides from the effect of 5'--3' exonuclease activity of the complete enzyme. Figures 1; references 12: 6 Russian, 6 Western.

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CSO: 1840/161

BIOTECHNOLOGY

UDC 576.8.093.33

BATCH CULTURE OF MICROORGANISMS WITH CONSTANT SUBSTRATE CONCENTRATION

Moscow PRIKLADNAYA BIOKHIMIYA I MIKROBIOLOGIYA in Russian Vol 21, No 4, Jul-Aug 85 (manuscript received 17 Jul 83) pp 510-515

[Article by N.S. Markvichev and M.N. Manakov, Moscow Institute of Chemical Technology imeni D.I. Mendeleyev]

[Abstract] Description is provided of a batch filter fermentor for the cultivation of microorganisms under conditions of relatively constant substrate concentrations and elimination of metabolic products. The system, designated Ecostat [Ekostat], relies on a high dilution rate on the order of $D = 7 \text{ h}^{-1}$, in conjunction with an ultrapore membrane filter (MFM-MA-9) having a pore diameter of 0.9 μm to separate the cells from medium byflow. High logarithmic growth rates were obtained with *Candida utilis* in a phosphate buffer medium at 32-33°C and an ethanol substrate in comparison with conventional batch cultures. Figures 3; references 13: 7 Russian, 6 Western.

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CSO: 1840/192

IMMUNOENZYME TECHNIQUES FOR EARLY DETECTION OF CONTAMINANT FLORA IN ALKALINE PROTEASE PRODUCTION BY *PACILLUS SUBTILIS*

Moscow PRIKLADNAYA BIOKHIMIYA I MIKROBIOLOGIYA in Russian Vol 21, No 4, Jul-Aug 85 (manuscript received 19 Jul 83) pp 558-564

[Article by A.Yu. Karulin, G.G. Orlova, L.P. Stepina, B.B. Dzantiyev and A.M. Yegorov, All-Union Scientific Research Institute of Biotechnology, Moscow; Institute of Biochemistry imeni A.N. Bakh, USSR Academy of Sciences, Moscow; Moscow State University]

[Abstract] Details are provided on modifications in the standard immuno-peroxidase assays for the detection of morphologically-similar contaminant bacteria in the production of alkaline protease by *Bacillus subtilis*. The studies involved IgG raised against *B. subtilis* in rabbits, isolation of the antibodies by various chromatographic techniques, and labeling with horseradish peroxidase. A binding inhibition and a sandwich technique were

defined with respective sensitivities for the contaminant cells on the order of 10^4 cells/ml in the former case, and 3×10^3 cells/ml in the latter case. The respective times of analysis for these two assays were 1.5 and 3 h. Figures 7; references 15: 7 Russian, 8 Western.

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UDC 577.150.7

IMMUNOFLUORESCENCE ASSAY IN CONTROL OF BACTERIAL CONTAMINATION OF CULTURE LIQUID DURING CULTIVATION OF BACILLUS SUBTILIS

Moscow PRIKLADNAYA BIOKHIMIYA I MIKROBIOLOGIYA in Russian Vol 22, No 1, Jan-Feb 86 (manuscript received 20 Jul 83) pp 86-89

[Article by G.G. Orlova, M.Ya. Korn, Ye.F. Grigoryev, V.I. Yefremova, S.G. Ivanov, N.N. Krivenchenko, All-Union Scientific Research Biotechnical Institute, Moscow; Scientific Research Institute of Epidemiology and Microbiology imeni N.F. Gamaleya, USSR Academy of Medical Sciences, Moscow]

[Abstract] The goal of this study was to develop a rapid immunofluorescent method for microbiological control which could identify bacterial impurities during early stages of the growth of alkaline-protease-producer *Bacillus subtilis*, so that in case of a problem, countermeasures could be applied. Fluorescent immunosera were obtained which could be used in detecting bacterial contamination within 1-1.5 hrs (as compared to traditional methods lasting 24-48 hrs). Figures 4; references 6: 4 Russian, 2 Western.

7813/13046
CSO: 1840/195

GENETICS

NEW GENERATION HEPATITIS VACCINE

Moscow MOSCOW NEWS in English No 50, 21-28 Dec 86 p 10

[Article by Yevgeniy Berestov]

[Text] Soviet scientists have obtained a new generation live vaccine by a technique that presents immunologists with fascinating possibilities.

The immune system is the body's guard. It identifies viruses by their shells or, rather, by the shell proteins which, once they have penetrated the human body, provoke a specific immune response. In the new technique these proteins are built up by human cells. The gene responsible for the synthesis of the shell proteins of a pathogenic virus may be transplanted into a harmless virus which will reproduce for some time in the human body, spreading the grafted gene. Vaccinia (the smallpox immunity virus) has turned out to be the most suitable.

In the genetic system of vaccinia there are so-called indifferent regions which can be altered without affecting the virus's proliferation. Yet, to fill these regions up with necessary genes is not to solve the whole problem for they may remain inactive in the body. In vaccinia, however, alien genes can be arranged in such a way as to make the cell synthesize the relevant protein.

An experimental live vaccine against hepatitis-B, a dangerous infectious disease affecting the liver and often leading to serious complications, has been jointly developed by scientists from the Vavilov Institute of General Genetics of the USSR Academy of Sciences, the Moscow Research Institute of Virus Preparations of the USSR Ministry of Health, and the Institute of Biochemistry and Physiology of Microorganisms of the USSR Academy of Sciences. There have not been any effective means of hepatitis prevention to date, while the treatment of the disease is a tough job stretched over a long period of time.

The creation of the vaccine against one particular disease is far from the whole story. The newly-developed procedure seems to indicate a universal way of vaccine synthesis that may provide effective means of preventing other infectious diseases.

Moreover, the "indifferent" regions of the vaccinia genetic system are large enough to accommodate a few alien genes. Hence, a multiple-effect vaccine against a whole range of diseases may soon be available.

The latest fruits of genetic engineering will most likely be useful for veterinary doctors. A research program to develop a cattle leukemia vaccine is already under way.

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CSO: 1840/223-E

PRESERVATION OF CALF EMBRYOS

Moscow TASS in Russian 8 Dec 86

[Text] (Riga) Specialists of the Institute of Microbiology of the Latvian SSR Academy of Sciences have started to develop a genetic bank in which calf embryos will be preserved. Acquired from high-class cows, they may be kept for decades at a temperature of minus 196 degrees. As required, it is necessary only to defrost them and implant them in low-productive animals. It is planned not only to preserve the embryos as stock but also to immediately employ them to increase the offspring of pedigreed cows.

/13046

CSO: 1840/223-E

IMMUNOLOGY

STUDIES ON ACID CHLOROFORM-METHANOL-SOLUBLE PROTEINS ISOLATED FROM NATIVE HUMAN LEUKOCYTE INTERFERON

Bratislava ACTA VIROLOGICA in Russian Vol 29, No 6, Nov 85 (manuscript received 18 Dec 84) pp 475-481

[Article by I.A. Leneva, A.V. Mikheyeva and Yu.Z. Gendon, Moscow Scientific Research Institute of Viral Preparations, USSR Ministry of Health; V.P. Kuznetsov, Moscow Scientific Research Institute of Viral Preparations, USSR Ministry of Health; and W. Seidel, Ernst-Moritz Arndt University, Greifswald, East Germany]

[Abstract] Studies were conducted with native and purified human leukocyte interferon (IFN α) to resolve the problem of contaminant hydrophobic proteins soluble in acidic chloroform-methanol solutions (ACMS). Standard peptide chemistry techniques resulted in the identification of 4 proteins soluble in ACMS in the native interferon preparation, with a 20-fold decrease in their concentration in interferon preparations purified by chromatography on Sephadex G-25, and complete elimination by adsorption to monoclonal antibodies. The two major hydrophobic proteins were represented by 27,000 to 55,000 dalton entities, and all were capable of inhibiting the activity of orthomyxovirus transcriptase. Since interferon alone lacks anti-transcriptase activity, the antiviral activity or therapeutic index of highly-purified interferon preparations may suffer by comparison with native preparations due to the lack of the hydrophobic proteins present in the latter. Figures 4; references 10: 1 Russian, 9 Western.

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MEDICINE

JOINT LUBRICANT ADDITIVE

Moscow TEKHNIKA I NAUKA in Russian No 10, Oct 86 p 31

[Article by Yu. Drize: "The Perfect Lubricant"]

[Text] It is the cherished dream of mechanical engineers to invent the perfect lubricant in order to minimize loss due to friction. However, a great number of lubricants are created annually, but still no perfect one exists. Then B.I. Kupchinov, a doctor of technical sciences from the Metal Polymers Systems of the Mechanics Institute of the Belorussian SSR Academy of Sciences, decided to borrow an experience from nature. Studying the operation of "friction points" in humans and animals, Kupchinov and his associates noted that human joints practically never wear out. For example, by the end of life our kneecap--a typical plain bearing--looks as if it had never been used. And there is nothing surprising in that: Unlike babbitt or fabric-laminate bearings, this natural bearing has a coefficient of friction that is practically zero. Accordingly, its products experience no wear. How has nature achieved such an effect?

Science can give the answer in general terms: It all stems from the synovial fluid which fills the spaces between the surfaces at the joint--it plays the role of lubricant in the bodies of humans and animals. Study of this liquid has made it possible to establish that the basic factor in reducing the coefficient of friction in joints is liquid-crystal compounds, in particular cholesterol. Yes, the same cholesterol that we struggle against enables us to run and jump without a thought to the problem of spare parts, the shortage of which often keeps automobiles, tractors, and combines out of action.

The mechanism of this phenomenon is still not very clear. Kupchinov thinks that liquid crystals, particularly cholesterol, cause a reorientation of macromolecules, as a result of which the coefficient of friction is reduced by a factor of ten (!). In any case, the experiments conducted by the Belorussian scientists have shown that adding liquid crystals to a fuel running-in mixture reduced the run-in time by a factor of three. "And after I added the liquid created in our laboratory to the lubrication system of my automobile," relates B.I. Kupchinov, "no signs of wear were evident." It is still difficult to list all the areas where the new lubricant could be used, but it is clear it will have a great many uses. But we would like to mention one special area of application.

We mentioned that ordinarily, a calyx of a human knee practically does not wear out. Rather, it does not wear out in healthy people. But what if a person has arthrosis, a chronic disease of the joints (most frequently the knee and hip joints)? This disease arises after traumas, and is accompanied by changes (wear) of the articulating surfaces. Existing methods of treatment cannot currently offer one hundred percent recovery, even when applied intensively.

Kupchinov approached the treatment of arthroses from a purely mechanical standpoint. If the articulating surfaces wear out badly, then the lubricant must be improved, he reasoned. And he proposed his own liquid crystal lubricant, borrowed from nature. Trials of the preparation in the Belorussian Institute of Traumatology and Orthopedics have shown superlative results. Out of a group of 70 patients, 69 showed significant improvement.

True, it is still a bit early to speak of a successful conclusion to the testing of a new medicinal preparation. We do not know how the preparation will act: What will be the consequences of the interaction of the joint with the foreign lubricating fluid, as yet untested by nature? Medical men must still answer these questions before giving the seal of approval to mass use of this artificial lubricant.

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PREVENTING DELIRIUM TREMENS

Moscow MOSCOW NEWS in English No 50, 21-28 Dec 86 p 10

[Article by Mikhail Karlov]

[Text] A simple, effective and accessible method for combating acute poisoning--especially that induced by alcohol and narcotics--has been developed by Moscow specialists.

"Acute chemical sickness" or, in plainer terms, various kinds of poisoning--connected with medicines, alcohol and drugs--is now leading in the world. For instance, in Europe it occurs twice as often as myocardial infarction. And it takes three times as many lives as road and traffic accidents. In this country efforts to combat this multifaceted deadly malady are directed by the All-Union Center for the Treatment of Acute Poisoning under the guidance of Professor Yeveny Luzhnikov. More often than not, the Center relies on its own inventions. The new method in question is one of the latest developments at the Center.

Out of every 100 patients brought here, 12 suffer from acute poisoning with alcohol or its substitutes. Quite often, many of these are already experiencing delirium tremens, i.e., alcoholic psychosis. Many are in the so-called abstinence syndrome, when a person, inexorably attracted by alcohol, is unable to extricate himself from a hard bout of round-the-clock drinking. The picture is roughly the same in the case of drug addicts. The afflicted require emergency medical help.

Alcoholism and drug addiction are vices which, not infrequently, arise due to human dissoluteness or weak will. But sometimes they are conditioned by reasons that are purely biological. Recently medical workers worked out a chemical theory concerning the origin of mental diseases (both drug addicts and alcoholics belong to the psychiatric sphere). Essentially, the problem boils down to the following: a surplus of some chemical substances, e.g., dopamines, gives rise to mental diseases. Or, an indomitable desire arises to "stifle" a surplus of these substances with alcohol or a narcotic. These substances are to be found in practically all people, but (under definite conditions) their concentration in the blood can register a sharp increase, followed by an ensuing critical condition. A surplus of such substances may also be conditioned genetically, but it does not make itself felt until some time when it is "triggered" by some seemingly harmless disease.

No matter what may have led a person to alcoholic poisoning, there is only one way to save him or her--by immediately removing the accumulated poison out of the victim's organism. Quite often the protein factors generating this state also have to be removed.

Until recently there was no specific treatment for cases of poisoning. The chemical compounds that neutralize poison were strictly selective: a definite antidote for a definite poison. A dramatic breakthrough was made with the advent of the method known as hemosorption--cleansing the blood of poisons by passing it through activated charcoals or synthetic absorbers. But... erythrocytes and thrombocytes, which are elements of the blood, were also taken out together with the poisons.

An attempt was made to cover the particles of charcoal with a protective film. It was effective. But the film deprived the blood of direct contact with the absorber--poisons were removed from the organism, but slowly. And the main thing, the hemosorption process was uncontrollable, the doctor not being in a position to influence it.

Luzhnikov turned to chemists for help. The problem was solved after several years of arduous searching. Yevgeny Luzhnikov, Professor Mikhail Tarasevich, laboratory head at the Institute of Electric Chemistry of the USSR Academy of Sciences, and Mark Goldin, Cand. Sc. (Chemistry), staff member of the Center, suggested a "method of absorbing toxic substances from biological liquids" which has now been patented. Essentially, it is the following: a sorbent (adsorber), e.g., coal of vegetable origin, is loaded into a column. A current-conducting rod is joined to the sorbent and an auxiliary material (graphite, etc.) is introduced. Then the poisoned blood, plasma and lymph are passed through the column. An electric potential is fed to the sorbent from an external source with the help of a rheostat. The main thing is that during the manipulation this potential can be fixed and changed in such a way that the blood and the sorbent enter into optimal interaction. A consequence was one more novelty--the potential selected after special characteristics led to the development of "live" coals with new properties. The effect of the sorbent polarized in this way was that hemosorption became controllable. The different poisons and, the main thing, the dopamines, which were accumulated in the blood, are removed quickly and completely.

Clinical tests demonstrated the method's indubitable merits. The most difficult thing for doctors using the traditional means is to take the patient out of the critical state. The method devised at the Center removes the abstinence syndrome during one or two sessions. Moreover, the subsequent treatment of alcoholics or drug addicts with generally accepted means proceeds much faster and easier than usual. The periods of remission after the sessions of controlled hemosorption become longer in the case of alcoholics and even more durable in the case of drug addicts. Add to this the fact that the blood is purified biologically, and the patient is freed from the sometimes harmful and unsafe side effects of the medicinal preparations.

When a patient is taken out of delirium tremens and abstinence syndrome, this is known as emergency aid. But the method can be used by way of

preventive treatment, as soon as a man feels that he will "break loose" in a day or two. Those who are acquainted with the method used at the Center come there on their own. One or two sessions, and months of normal, productive life lie ahead.

The new method can be used as a cure for the most diverse maladies. An improvement comes to those sick with various allergies (including bronchial asthma), endocrine disorders and many other cases. Of course, the method does not eliminate the root causes of these diseases, but alleviation comes for many months.

As I was told, the method is used for the treatment of alcoholism and drug addiction at several medical institutions in Moscow and at 22 Republic and regional centers for the treatment of acute poisoning. But, as it turned out, they can render real assistance only... in 2 percent of the cases! The whole point is that to this day these centers often exist only formally, on paper.

There are many reasons for that. One of the most important is coal. Specially treated, activated coal. A bottle of sorbent needed for only one manipulation costs the state from 36 to 70 rubles. Not counting the cost of the subsequent treatment. This is very expensive. Is there a solution?

Yes, there is. The new technology for obtaining the so much needed sorbent, worked out by the Center's specialists, jointly with the Institute of Electric Chemistry of the USSR Academy of Sciences and the USSR Ministry of the Chemical Industry, makes it possible to bring its cost down to... one ruble!

All that is needed is its large-scale application.

Combating alcoholism and drug addiction is a general human problem. Efforts to solve it are being made worldwide. The method of controlled hemosorption is not a panacea, of course, and does not solve it completely. But any contribution to the struggle against this serious social evil is exceedingly important. What is at stake are thousands of human destinies.

/13046
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NEW HIP PROSTHESIS

Vilnius SOVETSKAYA LITVA in Russian 26 Nov 86 p 4

[Text] The original design of a modular coxofemoral joint, developed by surgeon Samson Virabov from the Central Institute of Traumatology and Orthopedics imeni N.N. Triorov in Moscow, lacks analogy in worldwide medical practice. Many people with a congenital dislocation of the femur and diseases connected with immobile joints are doomed to walking on crutches their whole lives. But with the aid of this new prosthesis, they are saved from serious afflictions.

Here is one example. When a little girl had just begun to walk, her parents noticed that she had a slight limp. They sought a doctor. By examining the child a congenital dislocation of the femur was discovered. At that time, the joint was successfully set and the girl was able to walk normally. But at the age of 17, symptoms of disease appeared once again. An operation was performed, after which the disease subsided in only a few years. But later, acute pains resumed and the girl had to resume using crutches. The joint was completely destroyed by the disease.

In these types of situations, there is only one solution--to install an artificial joint. Doctors replaced the destroyed joint with a sectional prosthesis constructed by Samson Virabov. During the operation an ultrasonic saw was used to cut off the head of the femur. After special treatment of the socket, the cuplike, universal titanium head of the artificial joint, which is composed of several segments and is adjustable to any size, is inserted into the cavity. A few turns of a special key and as if unfurled, it settles firmly into the proper place. It is one of the secrets of the cement-free attachment of the prosthesis designed by Virabov. Subsequently, the cylindrically-shaped shank of the joint is installed in the channel of the femur. A prosthesis of this design restores painless functioning of the coxofemoral joint.

/13046
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MICROBIOLOGY

PROCESS OF DEVELOPMENT OF VIRAL-INFECTION COMPLICATIONS

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 13 Oct 86 p 4

[Article by M. Alekseyev]

[Abstract] The article reports on research of mechanisms by which neurological, cardiovascular and other disorders develop as complications of infectious diseases, particularly influenza. Associates of the Scientific Research Institute of Experimental Medicine of the USSR Academy of Medical Sciences (AMN SSSR) have been conducting this research with the participation of the Orenburg Medical Institute.

Doctor of Biological Sciences, Professor Rut Yakovlevna Polyak, head of the experimental-medicine institute's laboratory of molecular biology of viruses, told about results of experiments on animals which she said open up a new approach to the study of human illnesses in which viruses may be involved. Polyak related that a number of animals infected with influenza subsequently developed infections of the central nervous system in conditions of artificially-induced stress. It was hypothesized that some viruses acquired the ability to penetrate this system despite the presence of immune bodies and the brain's hematoencephalic barrier. The researchers discovered later that influenza viruses survived, sometimes for almost 6 months, in cells of the immune system and other organs of white mice which had recovered from influenza. The multiplication of such parasitic viruses sometimes proceeded very sluggishly, thereby preventing damage to cell membranes which might lead to destruction of the host cells by lymphocytes.

Laboratory staff personnel went on to demonstrate that in some cases the combination of viral infection with bacterial infection or stress leads to extremely grave consequences. Polyak explained that parasitic viruses build their own proteins into the membranes of host cells, stimulating rapid multiplication of saprophyte bacteria. These bacteria then begin to attack various organs and systems, complicating the course of the illness. This phenomenon was demonstrated in experiments performed under the direction of A. Totolyan, corresponding member of AMN SSSR. They were conducted jointly with the institute's laboratory of microorganism genetics.

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SYNTHESIS OF TYROSINE AND 3,4-DIHYDROXYPHENYLALANINE FROM LACTIC ACID BY CITROBACTER FREUNDII

Moscow PRIKLADNAYA BIOKHIMIYA I MIKROBIOLOGIYA in Russian Vol 21, No 3, May-Jun 85 (manuscript received 14 Jun 83) pp 342-348

[Article by M.B. Kupletskaya, Moscow State University]

[Abstract] The Department of Microbiology of the Biology Faculty of Moscow State University has isolated *Citrobacter freundii* bacteria with highly active tyrosine-phenol-lyase. Detailed conditions have been determined which support the synthesis of up to 94-95 g/l L-tyrosine and 41-42 g/l DOPPA using pyruvic acid as a precursor. The task of the present work was to develop conditions to replace the pyruvic acid with less expensive lactic acid. The best yield of tyrosine achieved was 35-38 g/l, on a substrate containing, in percent: lactic acid 4.0, phenol 0.5, distilled water, pH 8.0 adjusted with ammonia. The lactic acid was neutralized by the ammonia after addition to the substrate. The quantity of cells was 6 to 10 g/l, temperature 30-32°C, aeration and mixing. Phenol was introduced at 2-4 g/l, each 5 hours, to a total quantity of 20 g/l. Incubation time was 30-40 hours. Figures 3; references 7: 5 Russian, 2 Western.

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EFFECT OF BENZOHYDROTHIOCHROMILIUM SALTS ON THE MEMBRANE APPARATUS OF BACTERIA

Moscow PRIKLADNAYA BIOKHIMIYA I MIKROBIOLOGIYA in Russian Vol 21, No 3, May-Jun 85 (manuscript received 11 Oct 83) pp 382-390

[Article by R.T. Kutsemako, V.A. Yermachenko, Yu.V. Kulyash, Ye.F. Kharatyan, I.M. Simakova and M.A. Lukoyanova, Saratov Medical Institute, USSR Ministry of Health; Institute of Biochemistry imeni A.N. Bakh, USSR Academy of Sciences, Moscow]

[Abstract] The increasing antibiotic resistance of *staphylococcus aureus* continues to stimulate the search for new antistaphylococcus compounds. Benzohydrothiochromilium derivatives have been suggested as new low-toxicity antistaphylococcus compounds. The purpose of this work was to estimate the damage to the membrane apparatus of the bacteria produced by two thiochromilium derivatives--trifluoroacetate and iodide derivatives. It was shown that the compounds have both primary and secondary membrane activity. They inhibit the activity of the respiratory enzymes in an isolated membrane preparation, and also injure the respiratory apparatus in coccus membranes after the cells are grown on these compounds. It is considered possible that the thiochromilium

does not directly influence the biosynthesis of membrane proteins, but that the bonding with the membrane of some of the proteins is weakened, and these proteins are separated from the membrane during the process of producing a membrane preparation. The data indicate multiple mechanisms of action of thiochromium derivatives on the bacterial cell. Figures 6; references 17: 13 Russian, 4 Western.

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ENZYMATIC SYNTHESIS OF L-DIHYDROXYPHENYLALANINE BY FREE AND IMMOBILIZED CITROBACTER FREUNDII CELLS

Moscow PRIKLADNAYA BIOKHIMIYA I MIKROBIOLOGIYA in Russian Vol 21, No 2, Mar-Apr 85 (manuscript received 28 Mar 83) pp 161-166

[Article by K.I. Voyvodov, I.V. Tysyachnaya, L.S. Gubnitskiy, V.I. Yakovleva and I.V. Berezin, Moscow State University]

[Abstract] L-Dihydroxyphenylalanine (L-DOPA) is presently produced primarily by extractive and chemical preparations. A new and promising method of its production is enzymatic synthesis using free and immobilized cells of micro-organisms. Cells of Citrobacter freundii strain 62 synthesize L-DOPA from pyrocatechin and ammonium pyruvate with a yield of up to 42 g/l in two days. Immobilized cells are presently widely used as biocatalysts. The purpose of the present work was to compare the synthesis of L-DOPA from pyrocatechin and ammonium pyruvate by free and immobilized C. freundii 62 cells, and kinetic study of the conditions of the process. The free cells were immobilized by block polymerization in polyacrylamide gel with added ammonium acetate as an enzymatic activity stabilizer. In all experiments, some 70-90% of the cell protein was immobilized by this method, containing no less than 60% of the enzymatic activity. Formation of L-DOPA in the reaction mixture with native and immobilized cells was confirmed by thin-layer chromatography and liquid chromatography under high pressures. The results produced indicate that enzymatic synthesis of L-DOPA by immobilized C. freundii 62 cells is a promising method for production of this valuable medicinal preparation. Figures 2; references 16: 9 Russian, 7 Western.

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CONTINUOUS CULTIVATION OF THERMOPHILIC METHANOGENIC ASSOCIATIONS

Moscow PRIKLADNAYA BIOKHIMIYA I MIKROBIOLOGIYA in Russian Vol 21, No 2, Mar-Apr 85 (manuscript received 26 Apr 83) pp 255-259

[Article by Chan Dinh Toai, S.D. Varfolomeyev, S.V. Kalyuzhnyy, D.Ya. Medman and Ye.S. Pantskhava, Moscow State University; Institute of Biochemistry imeni A.N. Bakh, USSR Academy of Sciences, Moscow]

[Abstract] The production of methane by microbiological methods is a pressing problem in the area of utilization of anaerobic microbiological processes for the production of energy and fuel. Anaerobic methane-producing bacteria produced methane according to the equation $4\text{CH}_3\text{OH} \rightarrow 2\text{CH}_4 + \text{CH}_3\text{COOH} + 2\text{H}_2\text{O}$. This equation was used to calculate the balance of carbon during processing of methanol by the methane-generating association *Methanobacillus kuznecovii*. In periodic cultivation, the methanol concentration gradually decreased for 200 hours of growth, then dropped rapidly, at which time intensive liberation of methane began. In 13 days of incubation, the methanol was completely consumed. The rate of formation of biogas in the steady-growth phase was 0.3 liters of gas per liter of medium per day or 13 ml gas per liter per hour. The biogas contained 97.2% methane, 2% carbon dioxide and 0.8% hydrogen. The results indicated that the thermophilic methane-producing association, growing on a mineral medium containing methanol as the only organic substrate, developed quite well with continuous cultivation, yielding 4 to 9 times more gas than in periodic processing while achieving the same degree of conversion of the substrate. The optimal conditions of continuous cultivation, yielding maximum gas generation rate, were: dilution rate 0.0073 hr^{-1} , methanol concentration 2.5%. Figures 3; references 4: 3 Russian, 1 Western.

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EXTRACELLULAR CARBOHYDRATE-CONTAINING PRODUCTS OF METHYLOCOCCUS THERMOPHILUS

Moscow PRIKLADNAYA BIOKHIMIYA I MIKROBIOLOGIYA in Russian Vol 21, No 5, Sep-Oct 85 (manuscript received 26 Jun 83) pp 597-601

[Article by Yu.R. Malashenko, T.A. Grinberg, Z.P. Shurova, G.A. Vitovskaya and I.N. Lokteva, Institute of Microbiology and Virology, Ukrainian SSR Academy of Sciences, Kiev; Leningrad Chemical-Pharmaceutical Institute]

[Abstract] A study was performed of the conditions of formation and composition of extracellular carbohydrate-complexes produced by the obligate methylotroph *Methylococcus thermophilus* on methane. The formation of carbohydrate-containing products began in the exponential growth phase of the

culture and reaches its maximum in the stationary phase. The specific rate of formation of expolysaccharides was greatest in the phase of delayed growth. Later experiments indicated that the strain studied produces extracellular carbohydrate-containing products in the process of chemostatic cultivation with limitation of the source of nitrogen at 15 to 7.5 mg/l residual nitrogen. The product was found to contain mannose, galactose, glucose, fucose, xylose, ramnose, glucuronic acid and 0.4% protein. After desorption, demineralization, vacuum evaporation and precipitation, the product contained mannose, glucose, xylose, ramnose and 2.4% protein, an acid expolysaccharide containing the same carbohydrate components as the initial preparation, and a proteoglycane glycoconjugate. Figures 3; references 15: 7 Russian, 8 Western.

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SEDIMENTATION ANALYSIS OF RNA SEPARATED FROM INTERFERING PARTICLES OF LASSA AND MACHUPO VIRUSES

Bratislava ACTA VIROLOGICA in Russian Vol 29, No 6, Nov 85 (manuscript received 17 Jan 85) pp 455-460

[Article by I.S. Lukashevich, N.M. Trofimov, V.P. Golubev and R.F. Maryankova, Belorussian Scientific Research Institute of Epidemiology and Microbiology, Minsk, USSR]

[Abstract] Sedimentation analyses were carried out on the RNA of interfering particles of Lassa and Machupo viruses grown in persistently infected Vero and BHK-21 cell cultures, respectively. The Vero line was resistant to superinfection with the homologous virus, and the BHK-21 line showed similar resistance to the homologous Machupo virus. Both cell lines were susceptible to the heterologous virus. The RNA molecules of the standard viruses yielded 4 sedimentation peaks--28-31S, 22-24S, 18S and 4-6S--the first of which (28-31S) was lacking in the RNA of the interfering particles of both viruses. These observations demonstrate that the interfering particles of the Lassa and Machupo arenaviruses are of the defective type. Figures 1; references 24: 7 Russian, 17 Western.

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CSO: 1840/187

DEHYDROGENASE ACTIVITIES OF OIL-DEGRADING MICROORGANISMS

Moscow PRIKLADNAYA BIOKHIMIYA I MIKROBIOLOGIYA in Russian Vol 21, No 4, Jul-Aug 85 (manuscript received 10 Jun 83) pp 492-494

[Article by A.N. Bobkova, E.P. Tarkhova and L.Ya. Tatarenko, Institute of Biology of Southern Seas, Ukrainian SSR Academy of Sciences, Sevastopol]

[Abstract] Studies were conducted on the optimal conditions for the determination of dehydrogenase activity of *Pseudomonas qualis*, a bacterium shown to be highly efficient in biodegradation of petroleum hydrocarbons. The basic approach relied on the reduction of monotetrazolium blue to formazan and photometric reading at 490 nm in a 0.2 M phosphate buffer culture. The resultant data demonstrated that the pH optimum for dehydrogenase activity of *Ps. qualis* lies between 8.0 and 8.5, with a biomass concentration of 10 mg/4 ml and a dye concentration of 1 mg/4 ml. Under conditions other than those described, activity was depressed. Figures 3; references 12: 8 Russian, 4 Western.

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TRANSFORMATION OF MANGANESE OXIDES BY ACHROMOBACTER DURING MANGANESE ORE LEACHING

Moscow PRIKLADNAYA BIOKHIMIYA I MIKROBIOLOGIYA in Russian Vol 21, No 4, Jul-Aug 85 (manuscript received 10 Aug 83) pp 537-542

[Article by Yu.S. Babenko, M.Z. Serebryanaya and L.M. Dolgikh, Dnepropetrovsk State University]

[Abstract] A study was conducted on the mechanism of action by which *Achromobacter delicatulus* 182 effects transformation of manganese oxides of different varieties of manganese ores from the Nikopol deposits. In the case of the major component, MnO_2 , reduction proceeds as a two-stage process. The initial reaction consists of reduction of Mn(IV) to the Mn(II) form in the solid state without solubilization. The second stage involves mobilization of the insoluble MnO form from the solid form and its leaching as Mn^{2+} into the culture medium. Figures 2; references 11: 7 Russian, 4 Western.

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USE OF THIOBACILLUS FERROOXIDANS FOR SEPARATION OF MERCURY AND ANTIMONY SULFIDES BY FLOTATION

Moscow PRIKLADNAYA BIOKHIMIYA I MIKROBIOLOGIYA in Russian Vol 21, No 4, Jul-Aug 85 (manuscript received 5 Aug 83) pp 543-546

[Article by N.N. Lyalikova and L.L. Lyubavina, Institute of Microbiology, USSR Academy of Sciences, Moscow; Institute of Chemistry, Tajik SSR Academy of Sciences, Dushanbe]

[Abstract] Trials were conducted on the use of a culture of *Thiobacillus ferrooxidans* for the separation of HgS and Sb_2S_3 by the flotation method. The results showed the bacterial culture to be a more efficient agent than a standard chemical agent (perhydrol:potassium bichromate, 1:1). Treatment with the *Th. ferrooxidans* culture (10^6 cells/ml) for 1 h led to partition of 96% of HgS in the flotation concentrate, and of 90% of the Sb_2S_3 in the flotation tailings. The culture was reusable after partial regeneration.

References 3: 2 Russian, 1 Western.

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MILITARY MEDICINE

MILITARY SURGICAL STUDIES

Moscow KRASNAYA ZVEZDA in Russian 2 Oct 86 p 4

[Article by Ye. Agapova, KRASNAYA ZVEZDA correspondent]

[Abstract] The author reports on some of the specialties being practiced at the Carpathian Military Okrug's very progressive medical establishment. Implantation of synthetic eye lenses and other microsurgery of the eye are a major specialty, and the chief eye surgeon at the clinic, Col A. Yarmenko, described the precision skill involved. Unfortunately, the ultrasound and helium-neon laser operations are limited in number by short supplies of expensive synthetic eye lenses. Another specialty at the clinic is connected to the development of a pressure chamber that functions in synchronization with heartbeats. Military specialists are also engaged in advancing knowledge of battle pathology and blood losses. Several experts from the hospital's 21 treatment and 16 diagnostic sections were called immediately to Chernobyl to deal with the injured. The hospital can trace its work back to the days of World War II, when its personnel distinguished themselves in treating the wounded.

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MOLECULAR BIOLOGY

NEUROPEPTIDES IN DEVELOPMENT OF NEW DRUGS

Moscow MOSKOVSKAYA PRAVDA in Russian 14 Sep 86 p 3

[Article by B. Lyanov]

[Excerpt] A rabbit in a cage suddenly began to dash about in fright. What frightened it? Another rabbit, which had refused to eat its food, suddenly began to display an insatiable appetite.

What made these animals change their behavior so quickly?

"Special substances called oligopeptides," said V. Dushkin, head of a laboratory of the Scientific Research Institute of Normal Physiology imeni Anokhin of the USSR Academy of Medical Sciences (AMN SSSR). "These biologically-active compounds, which are like fragments of hormones, play a tremendous role in vital activity."

Certain substances of this type--neuropeptides, which are produced by the brain--are capable of relieving pain or improving memory. Such natural preparations still have not been studied in all their details, but it is clear that they are far more effective than many drugs.

"We have studied 10 of the more than 100 neuropeptides that are now known to science and have demonstrated the possibility of controlling biological motivations in a purposeful manner, strengthening or weakening them," related K. Sudakov, corresponding member of AMN SSSR and director of the institute. "This opens up prospects for utilizing neuropeptides in clinical practice for the treatment of disorders that are difficult to cure, such as obesity, phobias and pain syndromes."

Oligopeptides have been found to have substantial effects on artificially-created motivations, such as alcoholism and drug addiction. These cravings are blocked with the aid of oligopeptides.

Studies of the role of oligopeptides in the body are still in the experimental stage, but a number of substances are already being used to treat sleep disorders and digestive problems.

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DELETION OF LATE PROPHAGE λ GENES

Moscow MOLEKULYARNAYA BIOLOGIYA in Russian Vol 19, No 6, Nov-Dec 85
(manuscript received 6 Jun 84) pp 1457-1465

[Article by N.I. Matviyenko, I.N. Troyanovskaya, L.A. Zhelesnaya and O.B. Yarchuk, Institute of Protein, USSR Academy of Sciences, Pushchino, Moscow Oblast; Institute of Bioorganic Chemistry, USSR Academy of Sciences, Pushchino, Moscow Oblast; Institute of Biological Physics, USSR Academy of Sciences, Pushchino, Moscow Oblast]

[Abstract] Prophage mutants are widely used to study the regulation of phage expression. Defective lysogenes are also used as hosts for recombinant DNA in which expression of the foreign gene on the recombinant plasmid under the control of p_L or p_R promoters is regulated by a thermolabile prophage defect repressor. An *E. coli* prophage has been used to create a system for super expression of foreign proteins with recombinant DNA. Although promoter p_R , is the strongest phage λ promoter, no recombinant DNA has yet been produced using this promoter for the expression of foreign genes. The lysogenic strain $recA^-$ *E. coli* were used to produce deletion mutants of the L prophage. It was found that the mechanism of $recA^-$ independent recombination involves DNA-gyrase and no homology of recombining sequences is required. The standard method was used, search for deletion variants of the prophage among mutants resistant to chlorate under anaerobic conditions. The results indicate that mutations leading to resistance to chlorate and deletions in the tandem prophage occur independently. The development of deletions in the tandem prophage B, strain $recA^-$, is quite probable, occurring in approximately 10% of cases. The tandem prophage can therefore be recommended as a source of easily-detected deletion prophage variants. Figures 5; references 23: 5 Russian, 18 Western.

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CONSTRUCTION OF VECTORS FOR CLONING OF DNA REGULATOR ELEMENTS

Moscow MOLEKULYARNAYA BIOLOGIYA in Russian Vol 19, No 6, Nov-Dec 85
(manuscript received 14 Sep 84) pp 1546-1552

[Article by V.I. Kiselev, V.O. Rechinskiy, Yu.A. Manuylov and D.M. Pachkunov,
All-Union Scientific Research Institute of Applied Microbiology, Obolensk,
Moscow Oblast]

[Abstract] The purpose of this work was to construct a plasmid vector convenient for cloning and study of the functional properties of regulatory elements capable of controlling the expression of the aminoglycoside phosphotransferase (APT) gene in plant cells. The sequence involved construction of the plasmid pBRKm2, construction of the plasmid pKR14, construction of derivatives of pKR14 containing the APT gene without internal regulatory elements, and utilization of the pKR145 plasmid for cloning of promoters. Advantages of the genetic system developed include the possibility of selecting recombinant clones of plant cells in a medium with the antibiotic G418, simplicity of determination of APT activity in situ, and the presence of a polylinker in plasmids, simplifying analysis of the primary structure of the cloned regulatory DNA sequences. Figures 4; references 15: 3 Russian, 12 Western.

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STUDY OF STRUCTURE OF METAL-BONDING CENTERS OF CALMODULIN BY EXAFS SPECTROSCOPY

Moscow MOLEKULYARNAYA BIOLOGIYA in Russian Vol 19, No 6, Nov-Dec 85
(manuscript received 20 Nov 84) pp 1643-1647

[Article by A.A. Vazina, A.F. Korystova, V.M. Shelestov, S.Ye. Vernoslov,
V.Yu. Lunin, M.A. Kozlov and V.L. Krayzman, Institute of Biological Physics,
USSR Academy of Sciences, Pushchino, Moscow Oblast; Scientific Research Computing Center, USSR Academy of Sciences, Pushchino, Moscow Oblast;
Institute of Catalysis, Siberian Department, USSR Academy of Sciences, Novosibirsk; Scientific Research Institute of Physics, Rostov State University, Rostov-on-Don]

[Abstract] A study is presented of the Ca^{2+} -bonding centers of calmodulin, a unique protein which regulates the concentration of Ca^{2+} ions in a variety of processes: metabolism of cyclic nucleotides, phosphorylation of protein, regulation of the activity of a wide variety of enzymes, and formation of microtubules. This protein has been detected in both animal and plant cells. The molecular weight of calmodulin is about 17 kDa. A protein molecule

specifically bonds 4 calcium ions, 2 with $K = 1.3 \cdot 10^7 \text{ M}^{-1}$, 2 others with $K = 1.1 \cdot 10^4 \text{ M}^{-1}$. The EXAFS method could be used in this study because the calcium in the Ca^{2+} -bonding proteins was replaced by terbium, which has a higher bonding constant. The experimental results indicated that the Ca^{2+} -bonding centers of parvalbumin and calmodulin are identical. Figures 2; references 12: 4 Russian, 8 Western.

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CHEMICAL AND ENZYMATIC SYNTHESIS OF OLIGORIBONUCLEOTIDES AND THEIR APPLICATIONS

Moscow MOLEKULYARNAYA BIOLOGIYA in Russian Vol 19, No 6, Nov-Dec 85
(manuscript received 24 Feb 85) pp 1703-1706

[Article by D.G. Knorre, A.G. Venyaminova and S.M. Zhenodarova, Novosibirsk Institute of Bioorganic Chemistry, Siberian Department, USSR Academy of Sciences; Institute of Biological Physics, USSR Academy of Sciences, Pushchino, Moscow Oblast]

[Abstract] The fourth working conference on the chemical and enzymatic synthesis of oligoribonucleotides and certain aspects of their applications in molecular biology and medicine was held in October 1984, sponsored by the Scientific Council on Problems of Molecular Biology and the Institute of Biological Physics, USSR Academy of Sciences. The meeting indicated that many scientific teams in the USSR are working on the chemical and enzymatic synthesis and applications of oligoribonucleotides. A broad range of enzymatic methods is in use, based on the utilization of ribonuclease of varying specificity, polynucleotide phosphorylase and RNA-ligase. A basically-new approach is being used in a cycle of works on transcription of short oligodioxyribonucleotides in a system of highly purified DNA-dependent, RNA-polymerase. The status of studies on the synthesis of oligoribonucleotides is largely determined by the level of production of the corresponding biochemical reagents, particularly nucleic acid components and enzymes. Industrial methods of synthesis, isolation and determination of components of nucleic acids are under development. References 24: 21 Russian, 3 Western.

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PUBLIC HEALTH

POOR UTILIZATION OF FOREIGN EQUIPMENT AND DRUGS

Moscow PRAVDA in Russian 15 Jan 87 p 3

[Article by I. Vasilyev: "Bought and Forgotten. From a Committee Session of the USSR People's Control"; first paragraph in italics in source]

[Text] For some time now, medical personnel have been claiming that the process of dealing with patients has been complicated by a single circumstance. Patients become squeamish when they are offered any new type of treatment. The growing numbers of imported equipment and medicinals are in exceptional demand in that connection.

Well, then, conservatism is contra-indicated for the practice of medicine, and of course medicine is obligated to make use of global achievements if they are available. But are they? Here is the situation: For a period of one and one-half years thousands of patients at the Chelyabinsk City First Aid Hospital could not be examined because of a shortage of endoscopes. But right next door, at the City Hospital No. 1, every endoscopologist had ten such instruments!

The poverty of one therapeutic institution turns into the "glutting" of others. This is the conclusion drawn by a committee which studied the operations of the All-Union Association Soyuzmedtekhnika, the administration of Soyuzmedmontazhnaladka [All-Union Office for the Installation and Adjustment of Medical Equipment], and the Main Pharmaceutical Administration of the USSR Ministry of Health and its 110 subordinate institutions throughout the country responsible for the purchase and utilization of imported equipment and drugs. Equipment valued at 17 million rubles was found sitting idle just at the inspected facilities alone. The records in the RSFSR showed that imported drugs valued at 190,000 rubles had been checked off in one year's time. The waiting period for the repair of machinery that can not be handled by the specially organized Soyuzmedmontazhnaladka administration has now grown to two years.

The concept of "expensive" does not exist in the mind of a patient. People's health is priceless. And even in recent years, as the domestic manufacture of similar equipment has been growing, the Ministry of Health's expenditures have not been restricted. We are accustomed to trusting our physicians and we have

faith in the Ministry of Health. But it now turns out that this trust is far from being justified at all times.

In some cases it is none other than the sparkling finish and bright packaging of products that drive the organizers of the ministry's foreign trade operations. Without having studied the need for imported equipment, and without bothering to find out whether there are persons who can service the equipment or whether there are places that can accommodate the equipment, personnel at the Soyuzmedtekhnika are condemning the equipment to enforced idleness. It is in that same city of Chelyabinsk that two Japanese microscopes are being stored "until better times." Standing in splendor in the city of Gagra is the Yugoslav-made Undistat apparatus which is out of order. The warranty period of Siemens x-ray units delivered to Moscow and Leningrad is about to expire.

Persons at the Soyuzmedtekhnika cannot resist the magic of the billboard. After a lot of commotion was made about an international symposium, demonstration equipment that decorated the foyer was hastily bought up, although a large part of it turned out to be unneeded. Thus, the First Moscow Medical Institute imeni I. M. Sechenov acquired an incomplete non-functioning artificial kidney machine manufactured in the FRG for 13 thousand rubles. And the Primor District Hospital was bedecked by an obsolete Japanese Aloka echo chamber, which was also incomplete, for 26 thousand rubles. Spare parts for the machine, some of which were "extras" and some of which were in very short supply, were casually purchased "on sight."

PRAVDA has already written about the barbaric attitude toward medical equipment ("Council of the People's Control" No. 4 of last year). Rusted equipment valued at one and one-half million rubles was literally extracted from under the snow and iron obstructions by patrol vessels at the suburban Moscow base No. 1 of Rosmedtekhniki [RSFSR Administration for Medical Equipment and Instruments]. After that incident was made public, dozens of letters were received from practicing physicians saying that they longed to have such equipment! And now that the inflation of depreciated millions has been discovered, it is difficult to place any faith in the "measures undertaken" by officials at the Ministry of Health in their attempt to justify their negligence.

The compulsion to accumulate things was also manifested by personnel at the Main Pharmaceutical Administration. Today, hundreds of varieties of drugs are being purchased abroad. However, almost one-half of them have not been reviewed in 15 years, while the warehouses of domestic plants have been storing many thousands of similar preparations.

Sound practice is apparently not considered a question of economics for some people at the Ministry of Health. While giving the lowest priority to such concepts as the price, properties, and competitiveness of a commodity, they have become accustomed "to take" the maximum abroad, thereby making one more sharp turn toward the extensive development of their sector. Little do they care that it is the squandering of monetary funds, and not the acquisition of the final "product" -- the citizens' health -- that adds to the number of patient admissions and hospital bed-days.

The foreign trade turnover of the Ministry of Health is far from just a matter of kopecks. However, its collegium has shown little concern about how it allocates its foreign currency funds. Apparently, the people at Soyuzmedtekhnika seriously believe that the All-Union Scientific Center for Mental Health cannot function without the installation of Finnish furniture in the office of the Center's Deputy Director M. Vartanyan, at a cost of ten thousand rubles. And patients at the rehabilitation center in Gagra are incapable of getting into shape without limbering up on a bowling-alley manufactured in the FRG at a cost of 167 thousand rubles.

At the committee session, supervisors from the Ministry of Health tried to "justify" the import purchases as if someone intended to reduce foreign exchange appropriations. They had to be reminded about the essence of the problem, i.e., considerable public funds of which there still is a shortage for maternity and child care, aid for "remote areas," and for universal public preventive medical examinations, are being transferred into "dead stock" that so far has not been put into large-scale use by the Ministry of Health.

The persons guilty of squandering public funds must be held strictly accountable. These include Chief of the All-Union Association Soyuzmedtekhnika V. Rusanov, Chief of the Main Pharmaceutical Administration M. Klyuyev, Deputy Minister N. Shmakov, and other officials.

6289
CSO: 1840/302

COMPUTER-ASSISTED ELECTROCARDIOGRAMS

Moscow PRAVDA in Russian 18 Nov 86 p 6

[Article by B. Pipiya]

[Text] A computerized system, "Eskulap," which automatically interprets electrocardiograms and provides their results, recently became operational in a Leningrad Hospital.

Nurse [meditsinskaya sestra] V. Kingisepp attaches electrodes to the patient. Data such as the patient's sex, age, blood pressure and medications being taken are programmed into the computer. Then the system engages, and a message appears which says, "Error: Repeat Entry." It turns out that Valentina Ivanovna purposely did not connect one electrode to show me how "Eskulap" quickly registers the nurse's slightest mistake. The electrocardiogram was taken. The patient had not even gotten dressed when the results appeared on the monitor's screen and were immediately printed out on a recorder. The system includes a portable monitor for taking electrocardiograms at workplaces.

The head of the department of Functional Diagnostics, A. Izvekova, said that according to the program "Health," a person over the age 40 must have his heart examined once a year. Therefore, "Eskulap" is a wonderful aid during mass preventive examinations which we began to conduct at workplaces.

In 12 hours the machine interprets 500 electrocardiograms--the monthly work-load of a doctor. As for the accuracy of the results, in 90 instances out of 100, the system correctly diagnoses a normal condition of the heart. However, when the machine indicates that a person has a diseased heart, the "Eskulap" diagnosis is double checked.

Staff personnel of the specialized design and technological bureau "Biofizpribor," in close cooperation with cardiologists from the Military Medical Academy imeni S.M. Kirov, worked on the development of the system.

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MEDICAL ENGINEERING

Moscow NTR: PROBLEMY I RESHENIYA in Russian No 21, 4-17 Nov 86 p 6

[Article by A. Orlov]

[Abstract] An interview with V.I. Burakovskiy, Director of the Institute of Cardiovascular Surgery imeni A. Bakulev, discusses medical engineering. Burakovskiy complains that many medical innovations have never reached the manufacturing stage. He suggests that the manufacture of technical medical devices be assigned to the best instrument-building concerns in the country, those with a modern industrial base and highly qualified specialists. He notes that, at his clinic, large numbers of medical devices are used which must be imported from foreign firms. Burakovskiy recalls a meeting 30 years ago at which the Ministry of Health firmly resolved to undertake manufacture of medical instruments, many of which are still not made in the Soviet Union. One major reason that this is so is that it is not in the economic interest of manufacturers to produce medical equipment, and no amount of rhetoric or official policies will force them to do so. Furthermore, the USSR Ministry of Health and Academy of Medical Sciences have not given sufficient attention to the equipment needed for cardiovascular surgery. Also, a mechanism must be created to manage research, not only to start research projects on promising themes, but also and more importantly to stop wasting of effort on themes which have proven unproductive.

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COMPUTER PROGRAMMERS IN POLYCLINICS

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 12 Nov 86 p 4

[Article by Ye. Kolesnikova, Moscow]

[Abstract] Computer-assisted physical examination procedures, which have been used for one year at Moscow Polyclinic No 78, ensure more precise diagnosis and earlier detection of many diseases. The procedures utilize data from the patient's medical history. Patients answer more than 100 questions by

checking one of 2-5 answers to each question and a computer printout of analysis of the responses presents a diagnosis or indicates the need for attention of a specialist. The medical questionnaire was compiled by leading specialists of major medical centers and scientific institutes in Moscow. The computer memory holds records of thousands of patients on one magnetic disk. Use of this procedure has revealed many cases of incipient diabetes mellitus, coronary heart disease, etc. Patients have access to the procedure on a first come-first served basis, but patients requiring immediate assistance can indicate this fact and a physician can see them "out of turn." In addition to programmers, limitations on expansion and improvement of the procedure because of lack of equipment and funds are discussed briefly.

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CSO: 1840/167

COMPETITION OF PEDIATRIC NEUROLOGY TEXTBOOK FOR USSR STATE PRIZE

Moscow PRAVDA in Russian 16 Aug 86 p 2

[Article by A. Konovalov, Director, Institute of Neurosurgery imeni N. Burdenko, academician, USSR Academy of Medical Sciences, V. Tabolin, corresponding member USSR Academy of Medical Science]

[Abstract] The role of the textbook "Pediatric Neurology" by L. Badalyan, corresponding member, USSR Academy of Medical Sciences, in the development of pediatric neurology is described and discussed. The book summarizes the wealth of experience accrued in the area of Soviet pediatric neurology. It emphasizes aspects of early diagnosis, differential diagnosis and prevention of diseases of the nervous system of children. A network of pediatric neurological institutions has been developed in the Soviet Union with ample medical facilities and special training programs for future pediatricians. New methods of study of the brain include computer tomography, ultrasound diagnosis and precise graphic methods for recording nervous system functions. Treatment and rehabilitation facilities for neonates and nursing children have been greatly expanded. Badalyan's book is assessed as being worthy of a USSR State Prize.

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CSO: 1840/1004

HEALTH GOALS FOR KIRGHIZIA

Frunze SOVETSKAYA KIRGIZIYA in Russian 23 Sep 86 p 4

[Article by A. Tlin, Director, Kirghiz Scientific Research Institute for Obstetrics and Pediatrics, Professor]

[Abstract] The article reports on health advances that have raised life expectancy to near the average for the Soviet Union. Its high birth rate places the Kirghiz population among the fastest growing in the USSR. It has doubled since 1959, reaching 4,097,000. While some advances in pediatrics and care of mothers have come, most improvements have been made in chronic ailments of later life, such as those of the circulatory system, orthopedic problems, breathing and malignancies. Current research has been directed at obstetrics and pediatric issues, with special focus on demographic and statistical research to identify those factors causing childhood death and illnesses of mothers. A practical result has been the development of three variants of the sourmilk product intended for children. Called "Biolakt," it has been made available in all areas of Kirghizia as well as throughout the Soviet Union. New investments in medical facilities are being doubled for the 12th Five-Year Plan. Other subject areas receiving attention are working conditions for women engaged in agriculture, expansion of child care facilities and some educational efforts to limit family size. Certain areas where modern medical practices have not been put into practice include the Oshkaya, Narynskaya and Talasskaya oblasts, where, consequently, health statistics are not improving. The role of improved health care in improving production and economic growth is stressed.

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HEALTH PROGRAM AT MOSCOW PLANT

Moscow IZVESTIYA in Russian 13 Nov 86 p 3

[Article by S. Medvezhko, Moscow]

[Abstract] The article reports on work days lost due to illnesses, both of workers themselves and of their children, and successful efforts at the "Znamya revolyutsii" [Banner of the Revolution] Moscow Machinebuilding Plant in reducing these losses. The plant has used a combination of medical reports on illnesses and engineering approaches to improve the health aspects of the work place to reduce by 15.6% the incidence of illness. Work losses due to illness had been 6 times greater than those traced to other absenteeism and administrative leaves. Special kindergartens have been established at the plant with careful environmental control and physical training components. Pay incentives for healthy children have been adopted in these child care centers. An additional facility for child care amounts to a spa, with massaging pools, saunas and mineral water piped into the facility. When it

was noticed that reduction in illnesses were slight, it was learned that health workers were coming in for a rest, and steps were taken to restrict use to those whose health requires it. The comprehensive approach, ranging from health statistics to medical and engineering innovations for health purposes, is credited with the success of the program.

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ASSESSMENT OF SATURDAY AND SUNDAY MEDICAL CLINIC SERVICES

Tbilisi ZARYA VOSTOKA in Russian 23 Oct 86 p 4

[Article by Shota Gvinianidze, Tsiala Barnova, Nugzar Kinkladze and Vakhtang Kiknadze, ZARYA VOSTOKA correspondents, Liya Chkhaidze, consulting lecturer, Lanchkhutskiy Party Rayon Committee, Izolda Chkoniya, nurse, Lanchkhutskiy Rayon Clinic, and Yuriy Gokсадзе, physician, People's Controller of the Mayakovskiy Rayon Medical Association]

[Abstract] Individually, the authors visited various medical clinics during weekend hours to determine the extent and duration of services offered. They found that while the clinics visited were generally orderly, clean and staffed in morning hours, conditions were often crowded, with 2-3 physicians in a room seeing both male and female patients. Renovations and projected expansion of facilities were anticipated, but no firm dates were reported. As a result there were relatively few patients at some of the clinics. At other clinics, services were, by directive, to be provided from 9-6 each weekend day, but in fact only some specialties were represented and they were in operation only until 3 pm. The central rayon clinic was completely closed on Sunday, and little activity was found on Saturday either, partly because of renovation. Building materials were not being provided and workmanship was poor. Other sections of this clinic were in good condition, but no physicians were present.

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RADIATION BIOLOGY

RADIOBIOLOGY IN AGRICULTURE: NEW POSSIBILITIES

Moscow ADVANCES OF SCIENCE & TECHNOLOGY in English No 21, 5 Nov 86

[Article by Alexander Kuzin, corresponding member of the USSR Academy of Sciences, Chairman of the Radiobiology Scientific Council of the USSR Academy of Sciences]

[Text] One and the same substance may be both a poison and a medicine. Everything depends on the dose. A similar situation exists in radiobiology. Under its influence any living organism produces various chemical compounds, some of them are inhibitors--they suppress vital processes--others are effectors, they act as stimulants. The ratio between the two groups largely determines the overall effect of radiation on the organism.

In radiation-biology technology, the stimulating action of ionizing radiation is used to promote the growth of many agricultural crops. Genetic effects of radiation are employed to produce new plant varieties and increase their yields. The ability of ionizing radiation to suppress certain biochemical processes is utilized to lengthen the shelf life of foods.

Many of the radiation technologies are used in the USSR. Presowing treatment of seeds with gamma radiation, to take an example, raises the yield capacity of cereals by 10 to 15 percent, and that of vegetables by 20-30 percent, while exposure to radiation of the seeds of radish, cucumbers and tomatoes grown in hothouses guarantees their early ripening (5 to 10 days ahead of schedule). Yields rise to 25 percent. Besides, seed treatment improves the biochemical properties of the plants. For example, the green mass of maize grown for silage has a higher fat and protein content, while cabbage contains more vitamin C. Sugar beets increase their sugar content, and sunflower seeds, their oil content.

It may be noted that plants from exposed seeds have a more intensive respiration, they form chlorophyll more quickly and so the productivity of photosynthesis is greater.

The stimulating effects of low doses of ionizing radiation may be used not only in crop farming. In particular, a good promise is held out by experiments in which hen's eggs are exposed to gamma radiation before being placed in an incubator. the new technology, developed at the Institute of Biophysics

of the USSR Academy of Sciences and the Institute of Biochemistry of the Uzbek SSR Academy of Sciences, increases the yield of chickens from treated eggs. Hens that develop from exposed eggs have a good egg-laying ability. Ionizing radiation can with success be used to treat fish embryos to increase the production of fingerlings. Different living organisms and farm crops absorb different rates of ionizing radiation--presowing treatment of carrot seeds involves 2,500 to 4,000 rad., cucumber seeds 300 rad., and preincubator exposure of eggs a mere 3 to 5 rad. It will be recalled that 1 rad. is equivalent to 100 ergs of energy absorbed by 1 gram of substance.

So far we have been dealing with radiation doses that do not have an appreciable effect on the genetic apparatus of plants or animals. But selection requires artificially induced and inherited mutations. Way back in 1925, Soviet scientists Nadson and Filippov discovered that ionizing radiation could be applied to these ends. By now the USSR has evolved some 50 varieties of farm crops by means of radiation methods, as against some 300 in the world, according to the International Atomic Energy Agency.

For example, scientists from the Institute of Cytology and Genetics of the Siberian Department of the USSR Academy of Sciences and from the Siberian Research Institute of Crop Farming and Selection have evolved a spring wheat called Novosibirskaya-67, which has a high yield, high grain quality and resistance to lodging. This variety is sown in the USSR on an area of more than two million hectares.

Today's task of the selectionists is not only to produce high-yielding cereals but also to guarantee the required biochemical content of the grain. Using the proximate method developed to determine the amount and composition of proteins and changing the inherited forms of metabolism by ionizing radiation, it is possible to conduct a purposeful search for new varieties with pre-tailored properties.

Another example of the effects of ionizing radiation on the genetic make-up is work by Corresponding Member of the USSR Academy of Sciences Vladimir Strunnikov, who has devised a method of rearing only male offspring in silkworm. Male cocoons contain more silk than female ones and the Strunnikov method makes it possible to increase the effectiveness of the production appreciably.

Tissue incompatibility, combatted by physicians, also exists in plants. As a result of this, up to three-quarters of inoculated vine saplings are rejected, with resultant high losses. It should be remembered that the Ukraine and Moldavia carry out some 400 million inoculations annually, which are needed to combat phylloxera, a dangerous grape pest.

It has been found out that certain doses of gamma radiation are capable of suppressing the immune ability of the plant. But this is only part of the solution. The point is that, before inoculation, a graft has to be deprived of all its eyes. This is an extremely labor-consuming operation and is at present carried out mainly by hand. As eyes are removed, injuries are inflicted, with bacteria and parasitic fungi penetrating into vegetable

tissues. Correctly chosen doses of gamma radiation can suppress eye sprouting and inflict no damage on the graft tissues. The high penetrating ability of gamma rays fully mechanizes the operation, with labor productivity rising 20-fold. The Kvant-1 installation, built at the Moscow Gubkin Institute of Petrochemical and Gas Industry and the Scientific Production Association Vierul, guarantees the radiation treatment of 5 to 7 million saplings a season. The technology has no match in the world.

Radiation can be used to control the activity of microorganisms and food pests. In particular, exposure of prepared meat to ionizing radiation allows it to be stored at room temperature for 10 days. The taste, smell and quality remain unchanged. Sterilization of foodstuffs and medical products is very effective, too. For the first time it is possible to sterilize products in any packaged form and thus to preclude secondary infection in packaging. In addition, radiation methods alone can sterilize polymer-made injection syringes and parts for heart and lung and kidney machines. Chemical and heat techniques are inapplicable in sterilization of biological tissues, such as blood vessels and cardiac valves. Only ionizing radiation can destroy bacteria without injuring the living cells of the tissue.

Radiation biology methods are effective in neutralizing effluent waters. Only recently the problem was to reduce the harm done to nature by effluents, while now we take a different look. Effluent sediments are a nutrient for various microorganisms. Following radiation treatment, they may become a source of fertilizers and feed biomass. A shop to make dry fertilizers from effluent sediments is operating at Orekhovo-Zuevo, while the Nikolaev Hydrolysis and Yeast factory has a department making feed biomass.

Radiation methods today are becoming indispensable for many branches of the economy. Their further introduction will help to intensify production.

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CONFERENCES

SOVIET-ITALIAN PHARMACOLOGY SYMPOSIUM

Tashkent PRAVDA VOSTOKA in Russian 25 Oct 86 p 3

[Text] (UzTAG) "Our cooperation helps raise the standard of public health in two countries, announced Professor Vincenzo Longo, head of the Department of Pharmacology at the Rome Advanced Institute of Health, at the conclusion, on 23 October, of the Sixth Soviet-Italian Pharmacology Symposium, held in Tashkent. He stressed that Soviet scientists made significant contributions to molecular biology last year. Their research on the mechanism of the effect of various preparations at the level of cells, membranes and receptors is creating a new foundation for developing effective medicines.

In an answer to the question of the scientist's role in the modern world, Professor V. Longo said, "We firmly adhere to the position that it is the duty of scientists to conduct an increasingly industrious campaign with opponents of nuclear destruction, and to persistently explain to mankind the level of danger inherent in the arms race."

At the symposium, papers were presented on the most important work in pharmacology being conducted in the USSR and Italy. Participants summed up their cooperation over the last 2 years and accepted a program of future exchanges of information, trainees and the organization of joint research.

A feature of this symposium was that, in its work, even young scientists participated with skilled specialists. Association with pharmacologists with peaceful standards will be a great education for them.

During their stay in Uzbekistan the Italian guests visited the scientific and clinical institutes of Tashkent and did some sightseeing in Samarkand.

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MISCELLANEOUS

PHARMACEUTICAL INDUSTRY EXHIBITION IN MOSCOW

Moscow MEZHDUNARODNNYE I INOSTRANNYYE VYSTAVKI V SSSR: INFORMATSIONNYY SBORNIK in Russian No 28, 1986, pp 12-13

[Article by Valeriy Bykov, minister of the medical and microbiological industry: "Pharmaceutical Industry-87"]

[Text] The third international exhibition "Equipment for Drug Production and Control"--"Pharmaceutical Industry-87," which has become traditional, will be held in Moscow in January 1987. The exhibition enjoys great success among foreign participants. More than 120 firms from 13 countries took part in "Pharmaceutical Industry-82." Tens of thousands of people, including a large number of specialists, attended it. Contracts for the delivery of technological equipment and instruments for outfitting the drug producing industry were concluded during the exhibition. The commercial result exceeded several million rubles.

Basic Directions for the Economic and Social Development of the USSR for 1986-1990 and for the Period Until the Year 2000 envisage the implementation of an extensive social program. This program pays special attention to health protection, to the development of a network of general health and outpatient-polyclinic institutions, and to an increase in the volume of production of drug products (highly effective medical preparations for the prevention and treatment of cardiovascular, psychoneurological, oncological, and other diseases, as well as for the control of alcoholism and smoking) and of new drugs used in pediatric practice.

The achievements of modern physicochemical biology, which offers fundamentally new types of technology to production, serve as the basis for a successful development of the Soviet pharmaceutical industry.

Scientific research organizations and pharmaceutical enterprises of the Ministry of the Medical and Microbiological Industry are engaged in the development and production of drugs in the Soviet Union. They account for more than 90 percent of the volume of preparations produced in the country. Important work on expanding the list of drugs is carried out by the scientific institutions of the USSR Academy of Sciences, the USSR Academy of Medical Sciences, the USSR Ministry of Health, and other ministries and departments.

The pharmaceutical industry, which now has more than 100 modern industrial enterprises, scientific research institutes, and sovkhozes specializing in growing and procuring medicinal plants, is a dynamically developing sector with an annual increase of 7 to 8 percent in production volumes. A total of 25 to 30 new medicinal preparations are assimilated in the sector almost every year.

Basic directions in the development of drug production in the next 5 years envisage an increase in the output of highly efficient traditional preparations and the development of fundamentally new ones on the basis of biotechnology.

To accomplish these tasks, enterprises are being fitted with highly productive modern equipment. For this purpose more than 70 types of complete technological equipment for the production of antibiotics, hormones, synthetic drugs, and vitamins are being developed at the sector's organizations and pharmaceutical enterprises and at the country's machine building ministries. The development and introduction of complete technological lines and installations for continuous large-tonnage production facilities are also being planned.

Enterprises and organizations of the pharmaceutical industry productively cooperate with CEMA members. Scientific and technical cooperation is developing successfully in the Hungarian People's Republic in the area of production of machines and lines for the manufacture of flasks and ampoules from medical glass. A program for mutual deliveries of individual types of technological equipment for drug production between the USSR and the Polish People's Republic has been determined. In accordance with the adopted Overall Program for Scientific and Technical Progress of CEMA Members Until the Year 2000 the joint development of rotor and rotor-conveyer lines for pouring medicinal liquid preparations and infusion solutions into flasks and of lines for the production of polymer articles for medical purposes for a single application is to be carried out during the 12th Five-Year Plan.

Economic cooperation in weighing out and packing equipment is carried out with firms of industrially developed capitalist countries, including with the firms Comindex (Italy), Strunk and Hofliger and Karg (FRG), and Areenco (Switzerland).

It can be stated with confidence that complete lines and installations for the production and packaging of ready drugs and for the manufacture of packaging materials for drugs, robotized technological complexes, and special technological equipment and apparatus, which widely utilize robots, manipulators, microprocessors, personal computers, new materials, and other advanced technical solutions, are of the greatest interest.

We also hope to become familiar with the latest achievements of leading foreign firms in the area of production of automated instruments and systems for scientific research and laboratory analysis developed with due regard for the latest scientific achievements.

International exhibits held in the Soviet Union provide broad opportunities for specialists to get acquainted with the achievements of foreign science and technology and contribute to the development of mutually advantageous cooperation between Soviet organizations and firms in socialist and capitalist countries.

More than 300 firms from 15 countries were invited to participate in the international "Pharmaceutical Industry-87" show. The topics of the "Pharmaceutical Industry-87" exhibition presuppose an extensive showing of exhibits according to basic directions in outfitting chemical and pharmaceutical production:

equipment for drug production and packaging, including for obtaining drugs in ampoules, manufacturing powdery drugs, and weighing out and packaging hard medicinal forms and ointments;

equipment for the manufacture of containers (flasks and ampoules) and caps;

machines for washing, drying, and sterilizing glass and plastic capacities;

lines for the production and packaging of dressings and other articles for medical purposes, including for a single application;

apparatus and instruments for controlling production processes and outfitting research laboratories.

During the period of this exhibition's work it is planned to hold a scientific and technical symposium, at which reports by Soviet and foreign specialists on present-day tendencies in the field of technical outfitting of advanced technologies for the development of chemical and pharmaceutical products will be read.

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CSO: 1840/200

MEDICAL APPLICATIONS OF COMPUTERS AND MICROPROCESSORS

Moscow ELORG INFORMATION in English No 2, 1986 pp 36-37

[Text] In 1985 Moscow played host to the Zdravookhraneniye-85 (Public Health) international exhibition. Taking part in it were numerous companies and organizations from Europe, Asia, Africa, and America. The Soviet section was the largest and occupied a whole pavilion. Its exhibits included a lot of advanced equipment incorporating computers and microprocessors exported by ELORG. The following is a brief description of some of the Soviet exhibits.

Automated functional and diagnostic examination system. Its purpose is to collect and process data on the physiological state of patients. It also provides syndromologic information on the respiratory and cardiovascular systems, as well as the bioelectric activity of the brain both at rest and under physical strain.

ECG's can be entered into the system by telephone.

Input data are analyzed on the basis of an algorithm which serves to evaluate the dynamics of a patient's state. The system also estimates the quality of an examination. It incorporates a microcomputer of the Elektronika series and an ES-1045.01 general-purpose computer with a working storage capacity of 4 Mbytes and an operating speed of 800,000 operations per second.

Microprocessor diagnostic set. It is used for clinical examination in cardiology, surgery, and neurology. It operates in the off-line mode and processes electrocardiograms, electroencephalograms, rheograms, and sphygmograms. Diagnostic information is transmitted to a cassette recorder.

The set speeds up medical examination and improves accuracy of diagnoses.

It incorporates a K1801VM1 microprocessor which has a speed of 450,000 operations per second. The set's working storage capacity is 32 Kbytes and its permanent storage capacity is 64 Kbytes. The weight of the set is 14 kg and its dimensions are 420x230x450 mm.

General examination set. This serves to measure a patient's weight, height, arterial pressure, muscular power of the hands, heart rate, temperature, intraocular pressure, and other parameters. A complete examination takes

only 20 minutes. The set makes it possible to examine as many as 16 persons at a time.

The set incorporates an SM-1800 microcomputer which has a speed of 200,000 operations per second and a working storage capacity of 64 Kbytes. It also comprises 4 to 10 videoterminals and a printout unit.

SAORI-01 is a system for automated processing of radioisotopic diagnostic information. Complete with a gamma chamber, it serves for a rapid examination of the cardiovascular system. After an isotope is administered to a patient, the display shows a color image of the organs being investigated.

A special application program package has been developed for isotope diagnostics.

The SAORI-01 system incorporates an SM-1420 minicomputer which has a working storage capacity of up to 2 Mbytes and a speed of 1,000,000 operations per second.

Volna is a system for electrocardiologic examination of the myocardium. It serves to diagnose and locate an asynchronous excitation focus in the myocardium and provide a sufficient amount of data for its surgical removal.

The system reproduces spatial excitation wave propagation patterns and measures electrophysiological parameters of the myocardium.

It comprises 63 data input channels. Incoming data are entered either through a plurality of simultaneously-operating channels or through a randomly-selected channel.

The system comprises an interface and an Elektronika-60M microcomputer which has a working storage capacity of 64 Kbytes and a speed of 250,000 operations per second.

Cardiologiya is a system which serves for preventive and detailed cardiologic examination of large numbers of persons.

It processes diagnostic data and collects statistical data. The incoming information includes arterial pressure measurements and case history data which help evaluate the risks of arterial hypertension and detect symptoms of cardiac ischemia. The system also records electrocardiographic data on patients in a relaxed state.

A primary examination enables a physician to detect groups of persons who need a thorough examination. The latter includes a detailed case history analysis which serves to detect symptoms of arterial hypertension, and bicycle ergometer exercises which serve to determine the state of the cardiovascular system.

Cardiologiya incorporates an SM-4/SM-1420 minicomputer and an Iskra microcomputer.

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